Contents

Notation (for Chapter 10) vii
Foreword ix
The authors x

1 Introduction 1
1.1 From blank page to complete building 2
1.2 The importance of 'good' concept design 3
1.3 Building design process and the RIBA stages 4
1.4 How to use this book 5
1.5 One hundred years of design experience 7

2 How to have ideas 8
2.1 Why do engineers need good ideas? 8
2.1.1 Four principles for idea generation 8
2.2 Tools for idea generation 10
2.2.1 What information do we need to have ideas? 10
2.3 The importance of divergent thinking 14
2.4 Unlocking your subconscious 16
2.5 Ideas through conversation 17
2.6 Iterative creative thinking 18
2.7 Conclusion 20
2.8 Practical 21

3 Sketching 23
3.1 The importance of drawing 23
3.2 Types of sketching 24
3.2.1 Concept sketches 24
3.2.2 Sketching in meetings (coordination sketches) 24
3.2.3 Sequence assumed in design (sketches for the contractor) 25
3.2.4 On-site sketching 26
3.2.5 Details sketching 27
3.2.6 Sketching for reports/competition work 27
3.2.7 Sketching to solve a problem 29
3.2.8 Sketching from other disciplines 29
3.2.9 Create a drawing habit 29
3.3 Tools for drawing 31
3.3.1 Paper and pencil 32
3.3.2 Line types 32
3.3.3 Hatch 34
3.3.4 Touchscreen and stylus 35

3.4 Top tips and practical guide to drawing 35
3.4.1 Top tips 35
3.5 Interviews with the professionals 37
3.6 Workshops 40
3.7 Practical: 100 things to draw in one minute 41
3.8 Books and websites for further information and inspiration 42
4 Communication 43
4.1 Learn to tell stories in a way other people can understand 44
4.2 Hitting the mark — making your communication intentionally targeted 45
4.3 Emails 47
4.4 Minutes 48
4.5 Connect 48
4.6 Listen 49
4.7 Feedback 50
4.8 Suggested further reading 50
5 Developing the brief — "You want me to design what?" 52
5.1 What is a brief? 53
5.1.1 Project outcomes 54
5.1.2 Sustainability outcomes 54
5.1.3 Quality aspirations 56
5.1.4 Spatial requirements 56
5.1.5 Develop the initial project brief 56
5.2 Beyond the brief 57
5.2.1 Project budget 57
5.2.2 Other considerations 58
5.2.3 Undertake feasibility studies — 'The importance of playing' 58
5.3 When might you need to develop a brief? 59
5.4 Brief development – taking an ill-defined brief and making sense of it 60
5.5 Using the brief to select the solution 62
5.5.1 Measuring the success of your solution 62
5.6 Having a go 63
5.6.1 Six ill-defined and poorly articulated briefs which need developing 63
5.7 Brief development — an example 64
6 Questions we must ask 68
6.1 What if? 68
6.1.1 Materials 69
6.1.2 Loads 70
6.1.3 Other 'what if' questions 71
6.2 How much? 72
6.3 Where do we start? 72
7 Geotechnical decisions 74
7.1 Introduction 74

7.2 Desk study 75
7.2.2 British Geological Survey (BGS) information 78
7.2.2 Planning Portal data 84
7.2.3 Other BGS data 84
7.2.4 Site visit/walkover survey 85
7.3 Site analysis 85
7.3.1 Factors that can be used to zone sites for development 85
7.4 Ground model and typical properties 86
7.5 Substructure scheme design 86
7.5.1 Foundations — permissible bearing capacity for shallow foundations 86
7.5.2 Settlement for shallow foundations 89
7.5.3 Shallow foundation construction 91
7.5.4 Deep foundations (piles) 91
7.5.5 Retaining wall design 93
7.5.6 Dewatering 95
7.5.7 Infiltration drainage 95
7.5.8 Pavement design 95
7.5.9 Gas protection measures for radon, methane 96
7.5.10 Shrinkage/swelling 96
7.5.11 Contamination 96
8 Developing a concept 97
8.1 The six key decisions you need to make simultaneously 97
8.1.1 Decision 1: Influence of ground conditions 97
8.1.2 Decision 2: Material selection 99
8.1.3 Decision 3: Structural system 103
8.1.4 Decision 4: Grids and structural layouts 106
8.1.5 Decision 5: Spans of floor and roof structures 110
8.1.6 Decision 6: On or off-site construction 114
8.2 Structural layouts 116
8.3 Roofs — where structural engineers get to have some fun! 120
8.4 Movement joints, lateral stability and robustness 123
8.5 Foundations 123
8.6 Practical examples 123
9 Stability, robustness and movement joints 124
9.1 Lateral stability 124
9.1.1 Horizontal loads 125
9.1.2 Global design (preventing overturning and sliding) 127
9.2 Element design (and when you can ignore it) 135
9.3 Robust design and the pitfalls to be avoided 136
9.4 A brief guide to disproportionate collapse and when it needs to be considered 140
10 Concept design calculations 142
10.1 Introduction 142

10.2 Pre-calculation checks — load paths and construction sequences 142
10.2.1 Load paths 142
10.2.2 Construction sequences 144
10.3 Empirical design — does it look right? 145
10.4 Concept design calculations 153
10.4.1 Establishing the loads 154
10.4.2 Determining the forces — approximate structural analysis 154
10.4.3 Sizing the elements 158
10.4.4 Typical elements 160
10.5 Documenting the calculations 187
10.6 Checking the calculations 188
10.7 Next steps 189
11 Practical examples of three generic building types — with two potential solutions for each 191
11.1 Introduction and design philosophy 191
11.2 Ten-storey high office building, with open plan layout 192
11.3 30m span single storey building, with open plan layout 215
11.4 Three-storey residential building/apartment block, with cellular layout 233
11.5 Suggested reading 235
12 What to produce at the end of the conceptual design process 236
12.1 Stage 2 report — the only output our client looks at 236
12.1.1 The importance of communicating the design to a different number of people 236
12.1.2 How to make reports accessible and professional — a ‘style guide’ 237
12.1.3 Content — what’s in and what’s out? 240
12.2 Drawings 245
12.2.1 BIM 246
12.2.2 What to include 246
12.3 Cost proposal 248
12.4 Programme and ‘information required schedule’ 249
12.5 Specification 250
12.6 Scope of works 250
References 251
The front cover image 255